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 G07C 1/30

(52) UK CL (Edition K)  
 G4T TAF

(56) Documents cited

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 EP 0193320 A US 4823928 A

(58) Field of search

UK CL (Edition J) G4T TAF, G4V VAK VAL  
 INT CL<sup>4</sup> G07C, G07F

(54) Card-operated parking meter

(57) An electronic parking meter is capable of being operated by cards similar to phone cards and credit cards. It consists of a body 5 with a liquid crystal display 1 (LCD) to exhibit present time, car registration number, finish time and parking penalty as well as other relevant messages. It includes an instruction plate 2, a slot 3 for receiving a parking card and an alphanumeric keyboard 4 with 39 buttons to key in car registration number, required parking time and any edits required. The parking card has a pre-programmed magnetic strip with a unique serial number and a number of parking units. The parking meter is capable of editing the number of the units on the parking card using read/write unit.

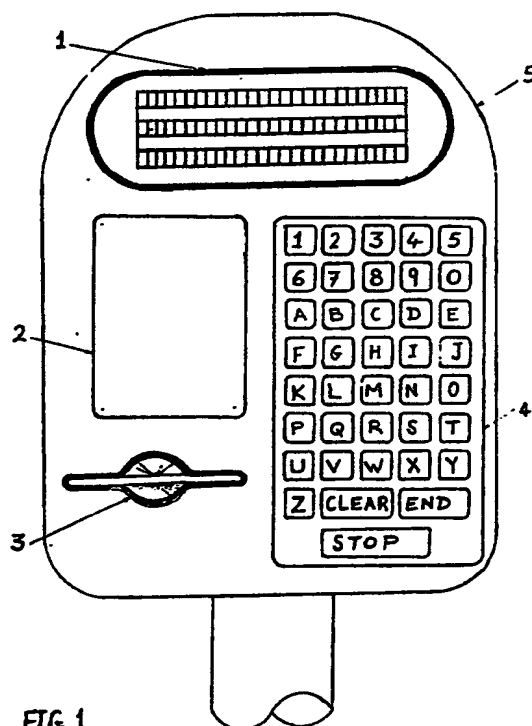
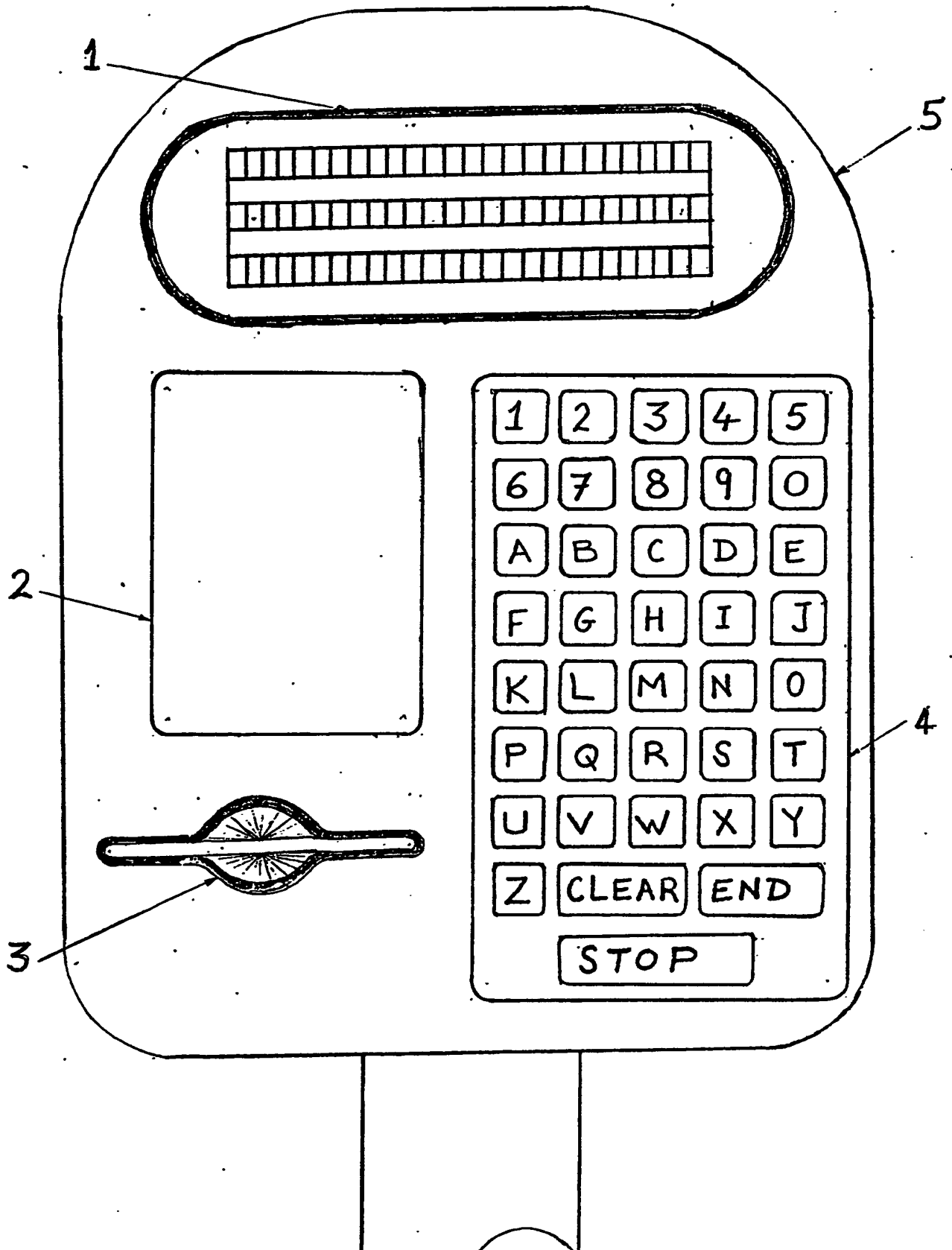


FIG 1

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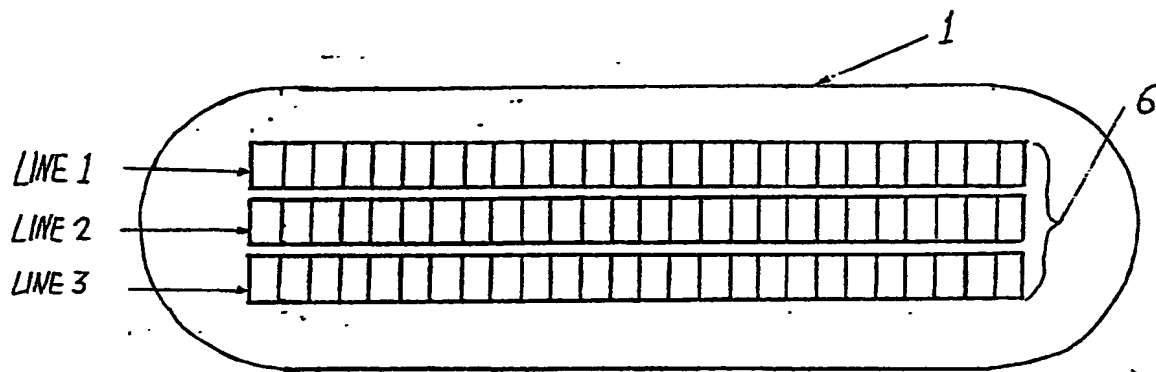


FIG. 2

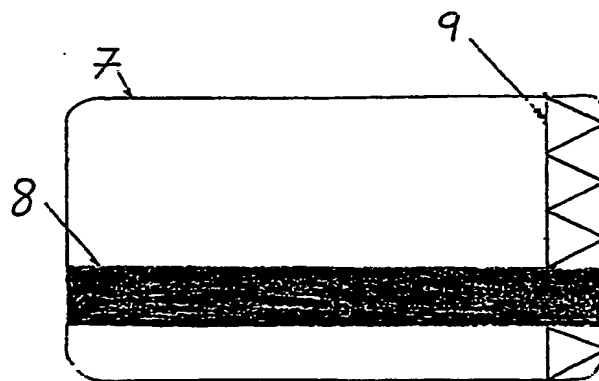


FIG. 3

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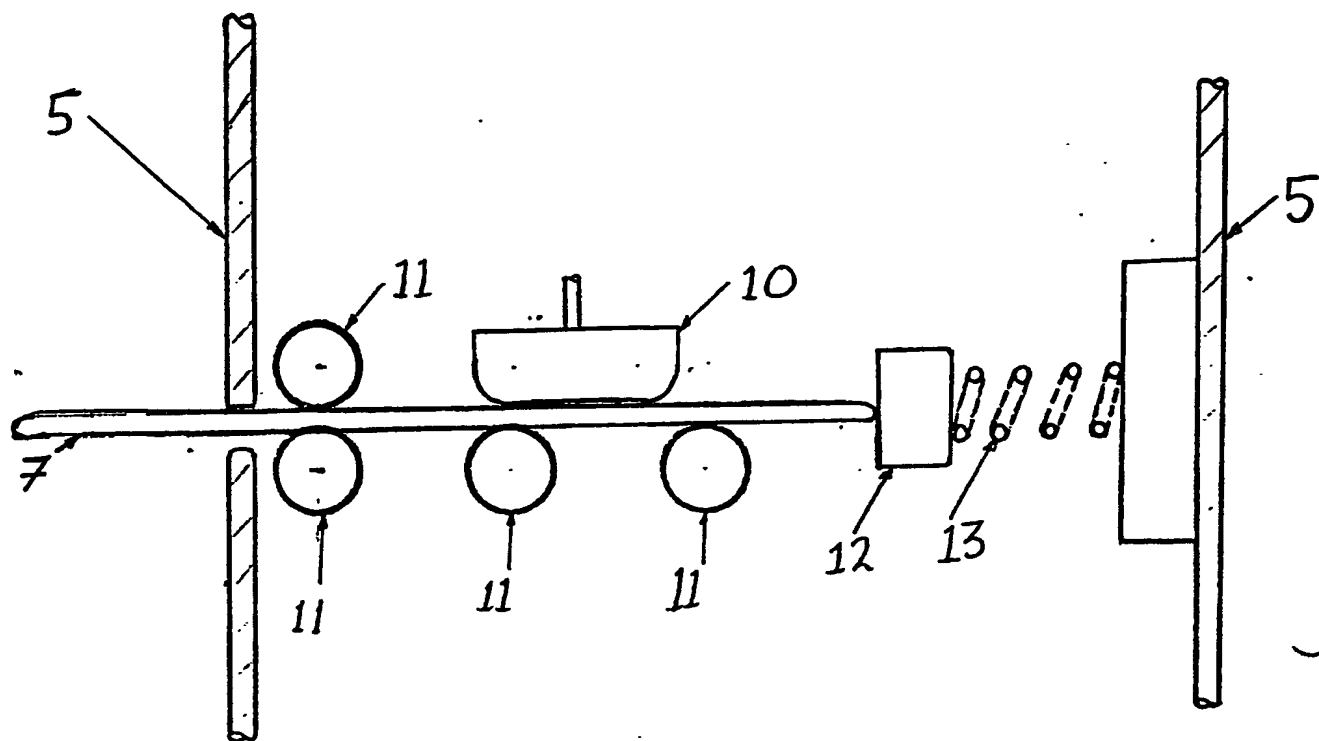


FIG. 4

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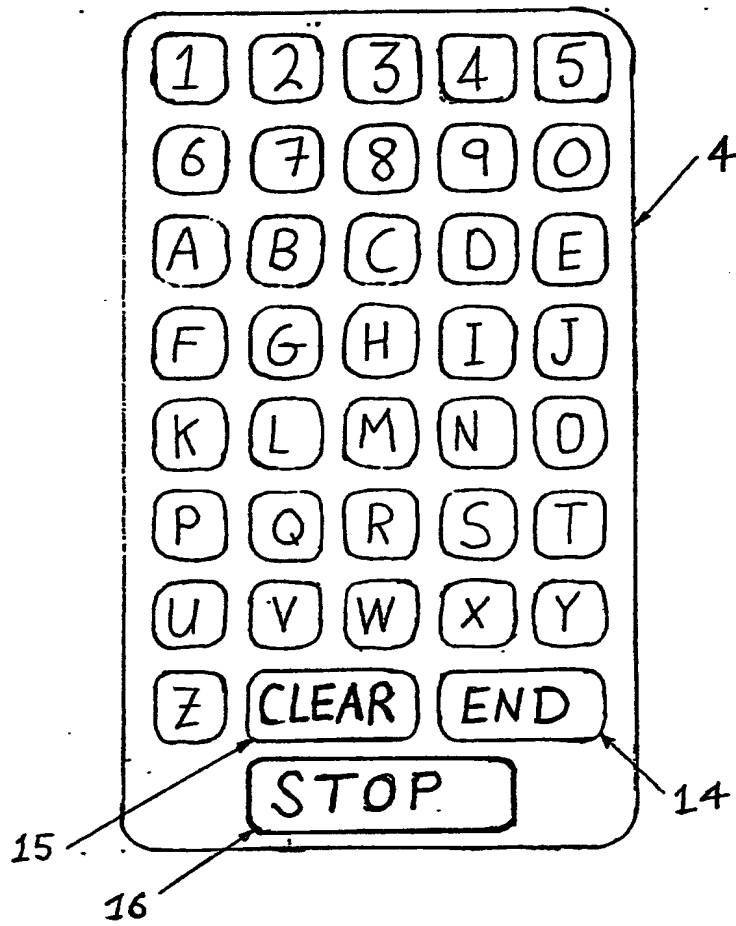


FIG. 5

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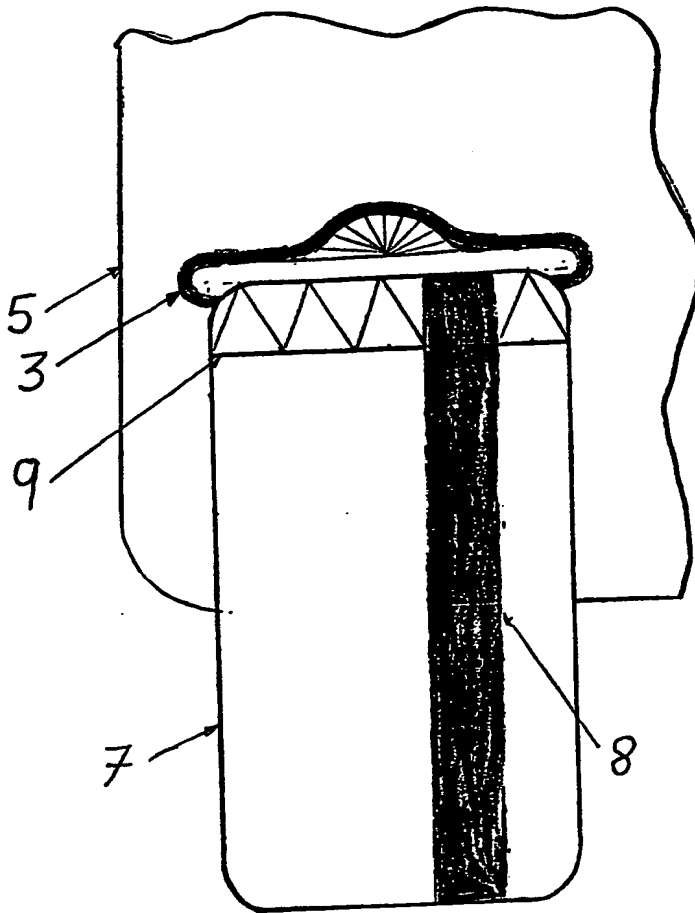


FIG. 6

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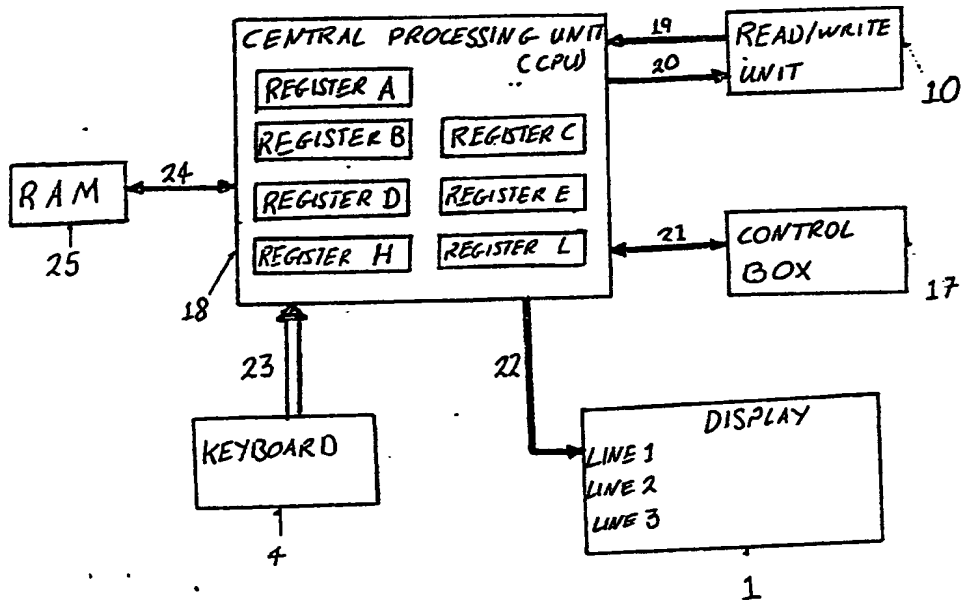


FIG. 7

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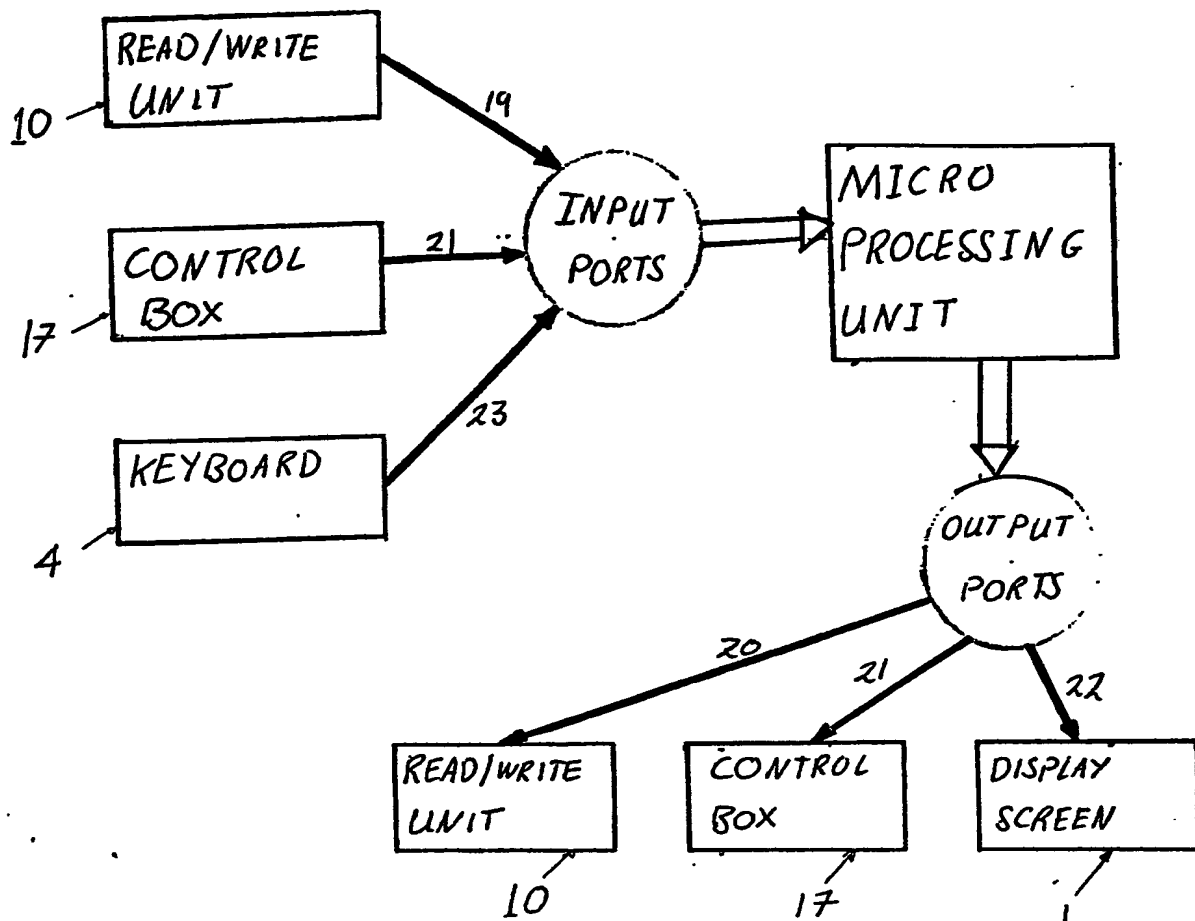


FIG. 8



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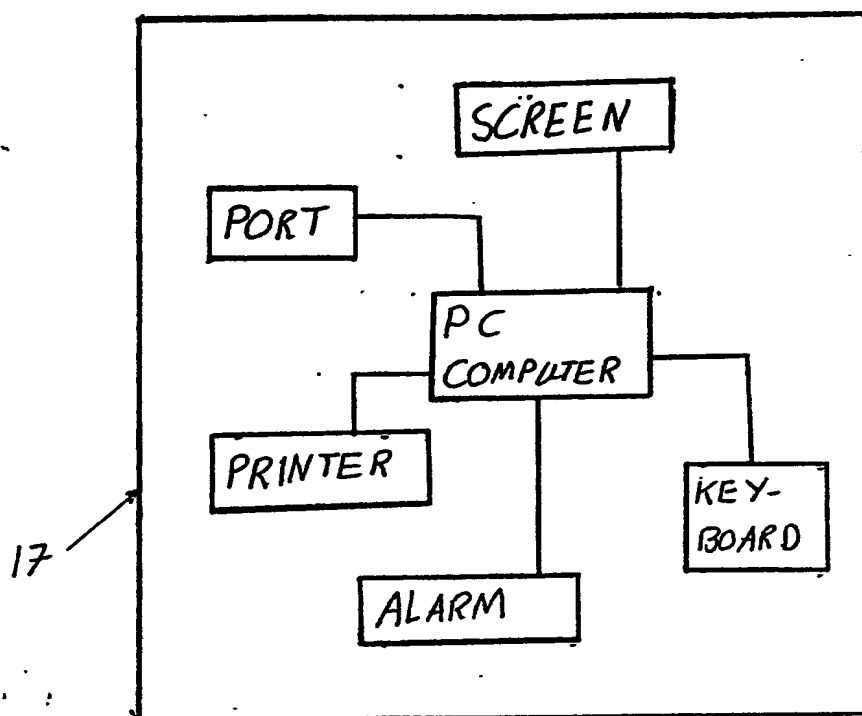
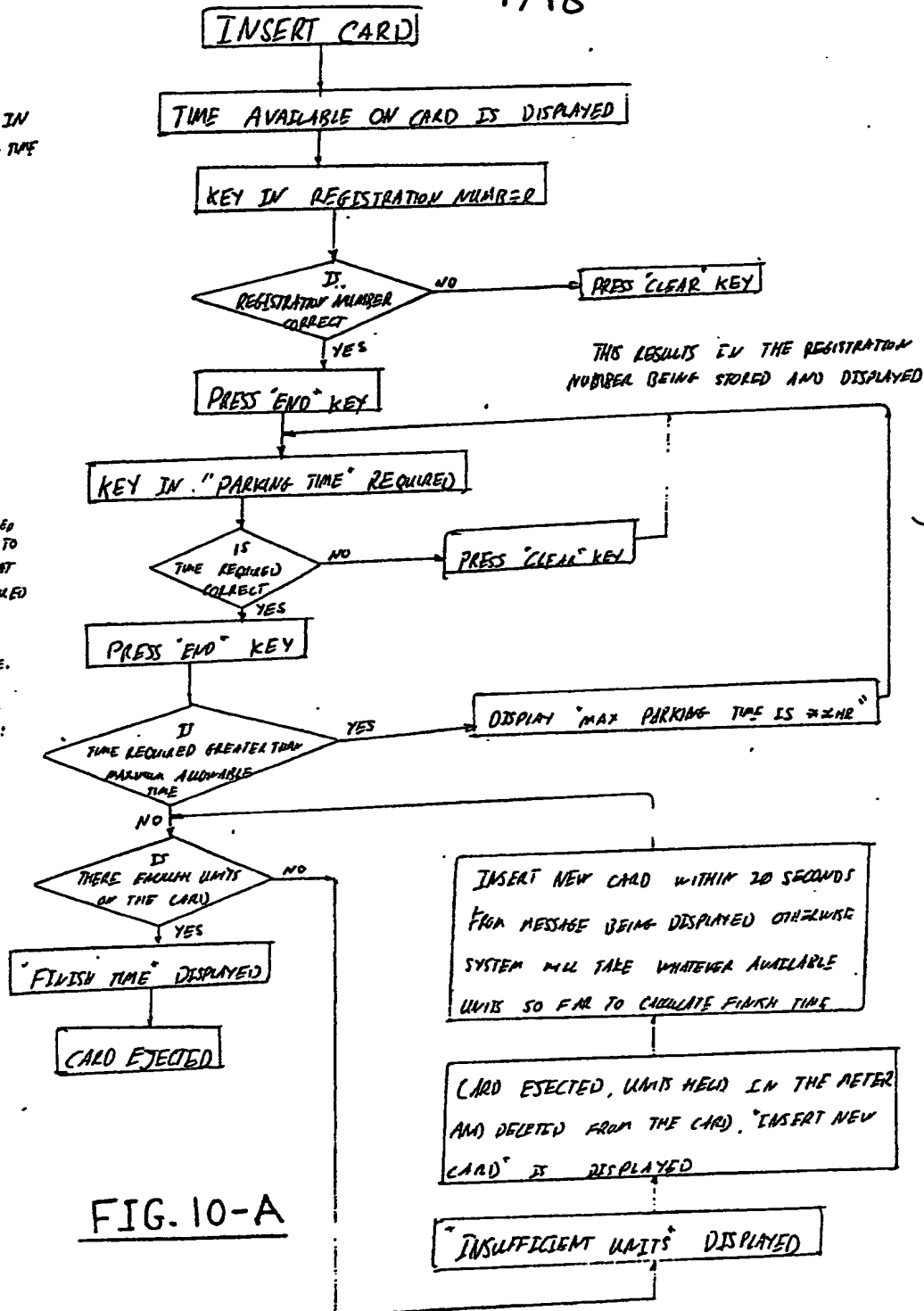


FIG. 9.

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CARD REMAINS IN  
UNTILL PARKING TIME  
STARTS

THIS RESULTS IN  
THE TIME REQUIRED  
BEING CHECKED TO  
MAKE SURE THAT  
THE TIME REQUIRED  
IS NOT GREATER  
THAN THE MAX  
AVAILABLE TIME.



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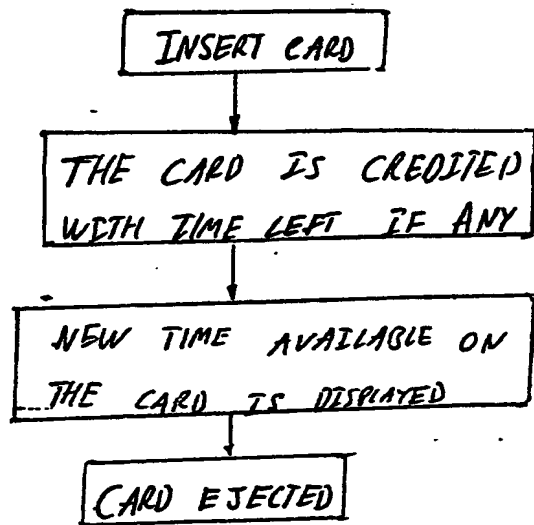


FIG. 10-B

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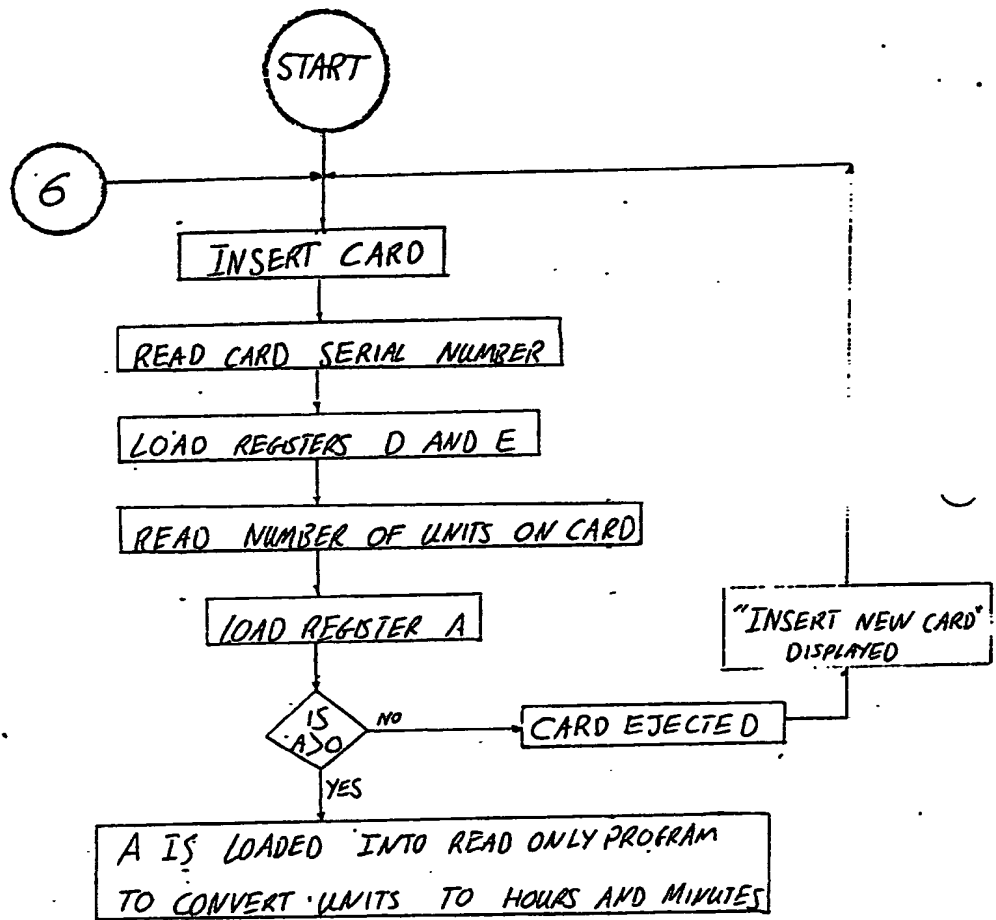


FIG. I

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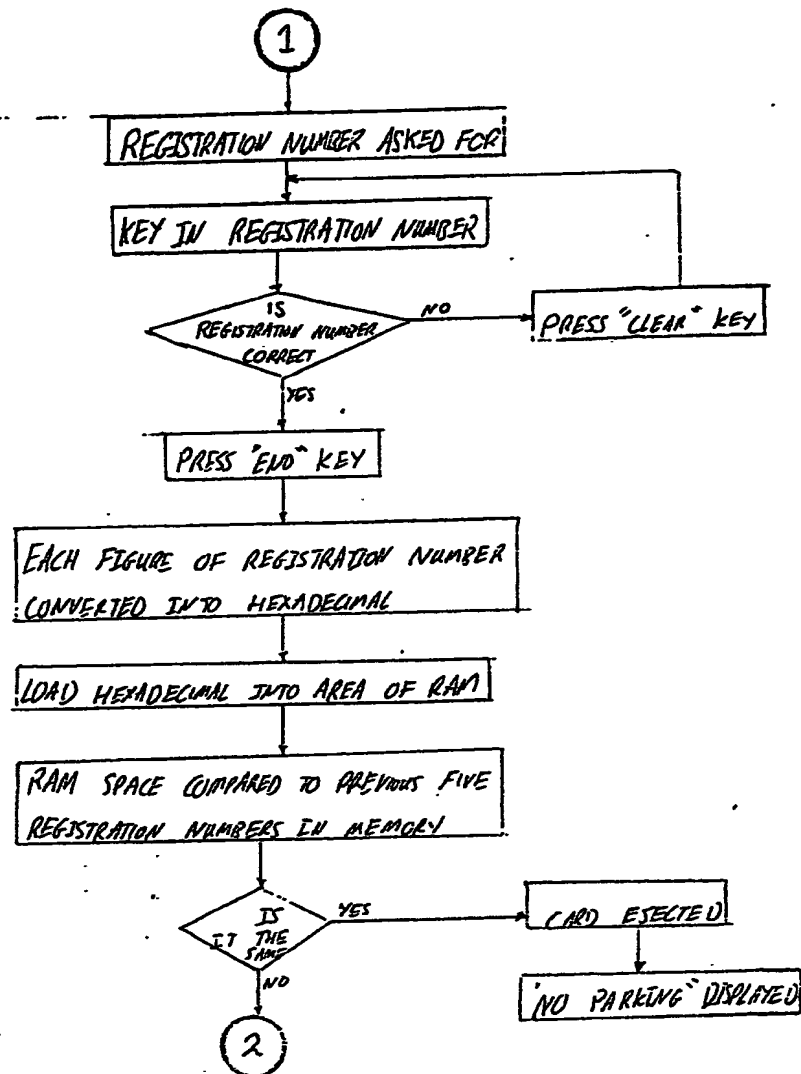


FIG. II

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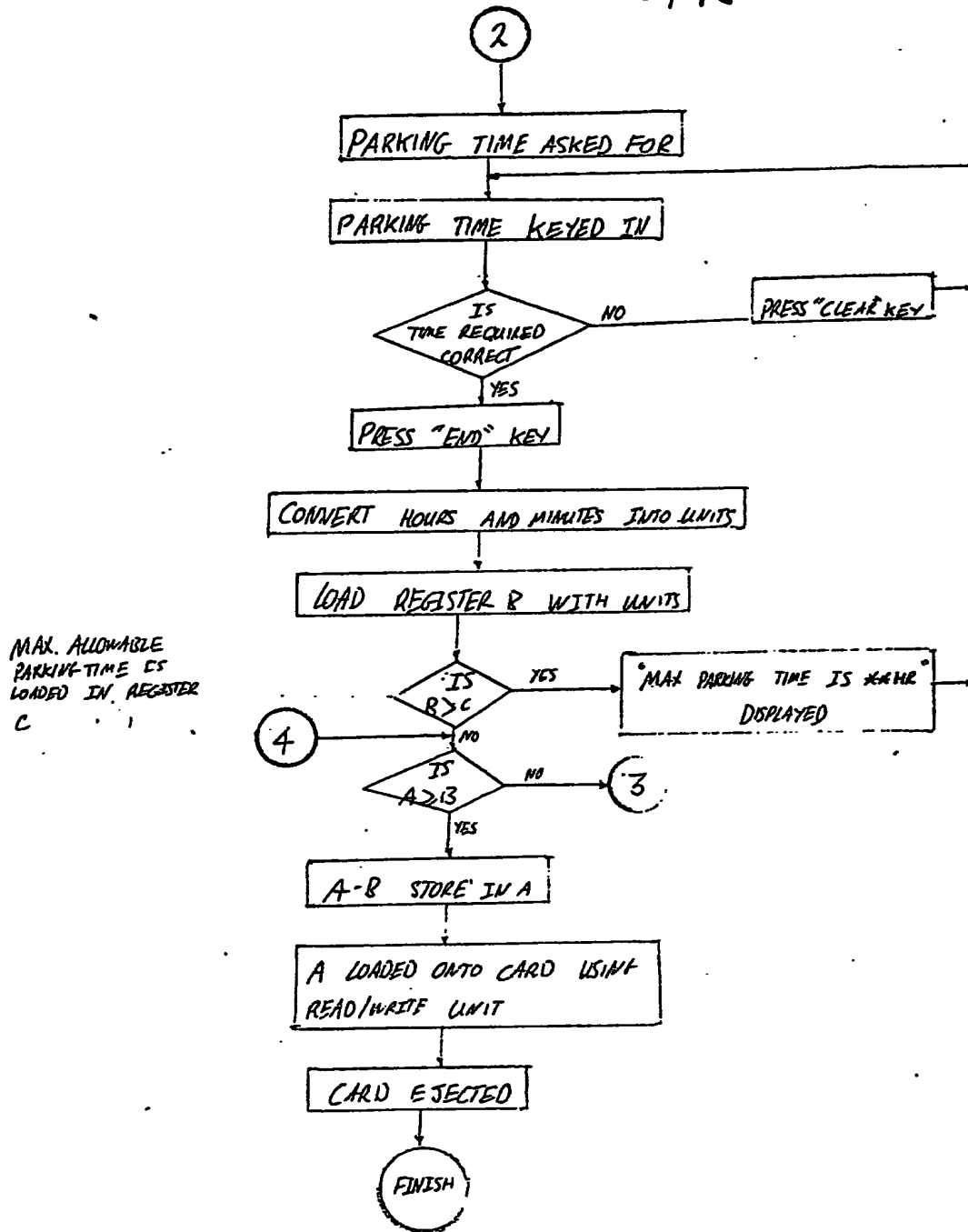


FIG. III

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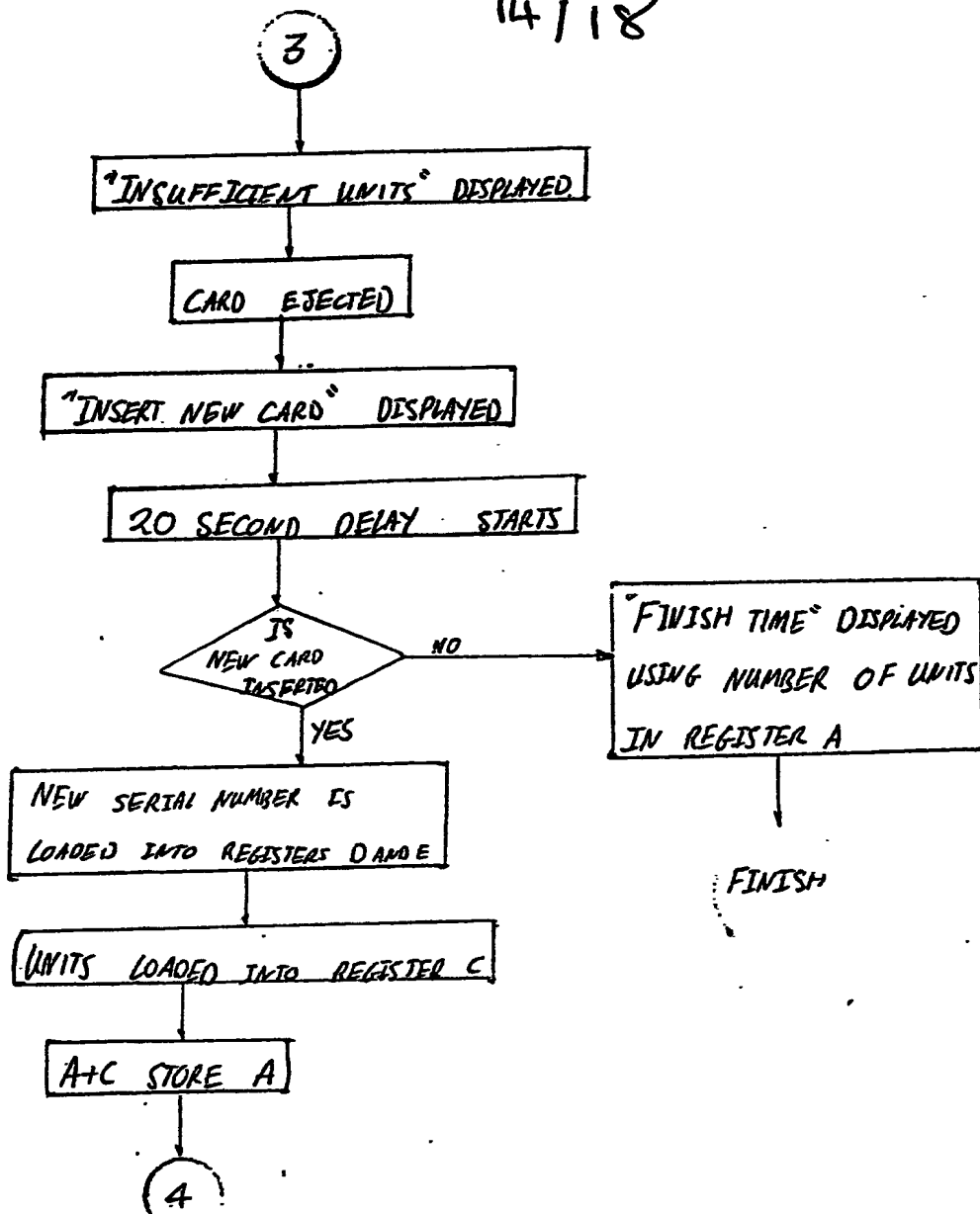
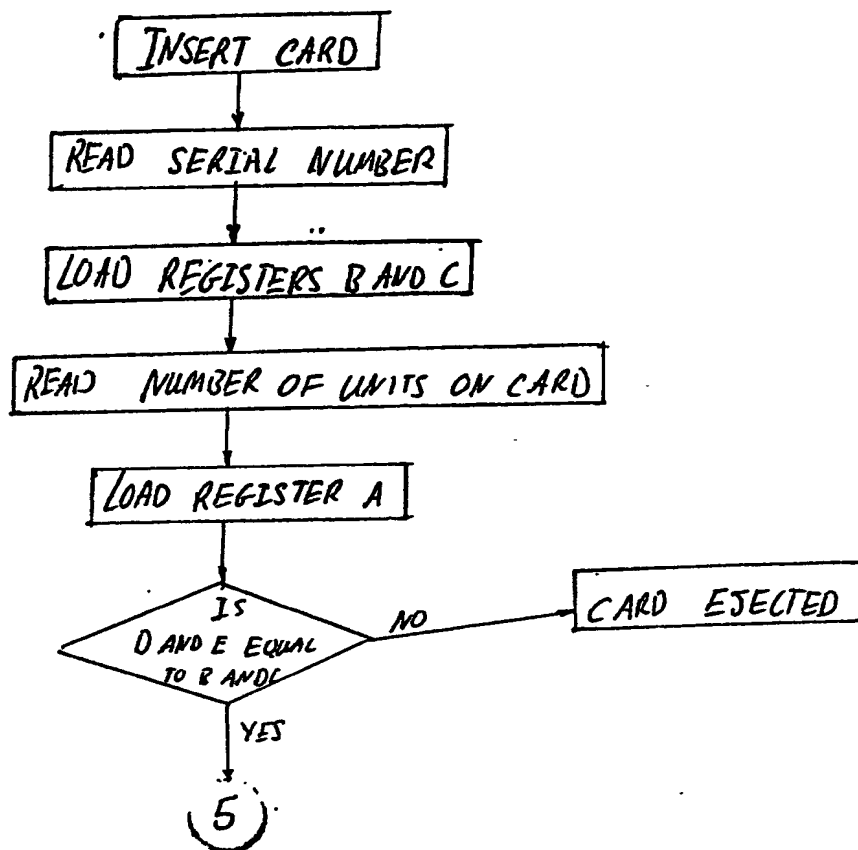


FIG IV

FIG. V



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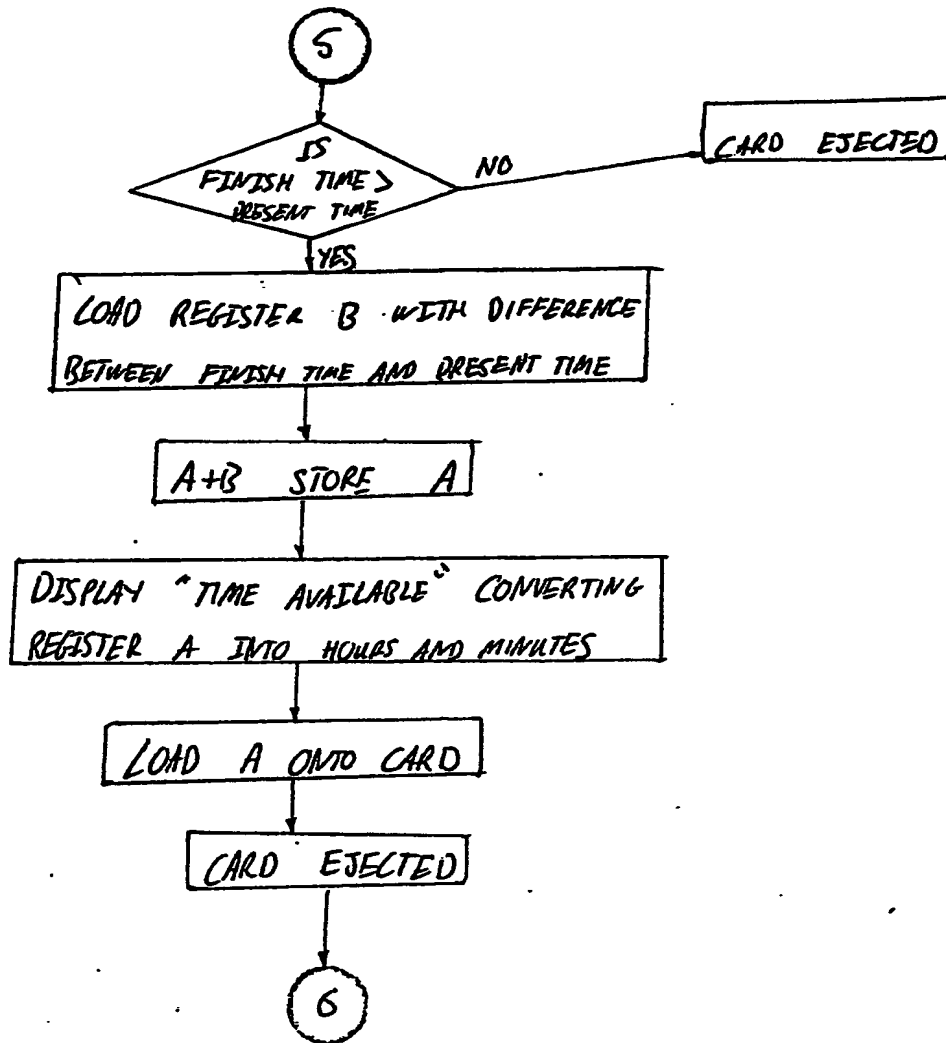


FIG. VI



* * * * *															
P	R	E	S	E	N	T	T	I	M	E	*	:	*	*	
P	A	R	K	I	N	G	T	I	M	E	*	H	R	*	M

*	*	*	*	*	*														
P	R	E	S	E	N	T	T	I	M	E		*	*	:	*	*	*	*	
M	A	X	P	A	R	K	I	N	G	T	I	M	E	I	S		*	*	H

*	*	*	*	*	*	*														
P	R	E	S	E	N	T	T	I	M	E	*	*	:	*	*	*	*			
F	I	N	I	S	H	T	I	M	E		*	*	:	*	*					

* * *	*																			
P	R	E	S	E	N	T		T	I	M	E		*	:	*	*	*	*		
I	N	S	U	F	F	I	C	I	E	N	T		U	N	I	T	S			

*	*	*	*	*	*	*													
P	R	E	S	E	N	T		T	I	M	E		*	*	:	*	*	*	*
I	N	S	E	R	T		W	E	N	E	C	A	R	D					

*****														
P	R	E	S	E	N	T	T	I	M	E	**	:	**	**
PARKING PENALTY														

## CARD OPERATED PARKING METERS

### DESCRIPTION

This invention relates to parking meters operated by cards similar to phone cards and credit cards.

The meters currently in use are operated by coins. Some of them accept 50 pence or £1 while others accept 20 pence coins only.

There is always the problem of having the right coins when parking the car. Also, some members of the public try to jam them to avoid paying the right charge.

If the meter is full of money it cannot be used.

Also authorised persons have to go round to empty them.

Most of the currently used meters have spirals (like clocks) to be wound by authorised persons. Some meters have digital display.

The information regarding parking rules and instructions, on how to use the meter are printed on metal plates fixed to the outside of the meter.

This invention provides parking meters operated by cards similar to phone cards and credit cards.

The following is a list of headings which describes this invention in detail.

- Description of the meter.
- How to use the system.
- The engineering logic of the meter.
- Control box.

### DESCRIPTION OF THE METER

The parking meter Fig.1 consists of a body 5 comprising a display 1, instruction plate 2, a slot for inserting the card and an alpha numeric keyboard 4.

The display 1: Fig 1 is a liquid crystal display (LCD) made up of three lines 6 Fig.2. Each line is capable of displaying 26 digits. Line 1 Fig.2 is used to display the car registration number. The message which appears on line 1 is 'key in registration number'. This lasts for 2 seconds. The display then clears and a flashing cursor appears on line 1. The registration number is keyed in. When it is completed and the 'end' key (No.14 Fig 5) is pressed the registration number remains on the display on line 1.

Line 2 Fig 2. is used to display the present time. This is displayed as 'present time \*\*: \*\* \*\*' (\* - represents variable). This is the only display which is not changed. The time will continue to increase.

Line 3 Fig.2 is used for the rest of the operations. This line had eight possible displays as shown in figures M1, M2, M5, M6, M7, M8, M9 and M11.

- a. 'Time available Hr Min'  
This display shows the amount of time available on the users card in hours and minutes.
- b. 'Parking time Hr Min'  
This display asks the user how much parking time is required. A flashing cursor appears to indicate that this is a required input.
- c. 'Insufficient units'  
This display tells the user that the number of units on the card is insufficient for the parking time required.
- d. 'Insert new card'  
This display asks the user to insert a new card. It follows after the 'Insufficient units' display but it is also displayed when the user inserts an empty card and it is ejected. A 20 seconds delay occurs after this to allow the user to insert a new card.
- e. 'Finish time'  
This display indicates the time for which the user has paid and must return by.
- f. 'No parking'  
This display appears if the user attempts to park illegally or when the authority operating the meters wish to stop motorists using a particular area of meters.

- g. 'Max parking time is Hr'  
This display appears when the user asks to stay longer than the permissible parking period. It appears to inform the user the maximum allowable number of hours that the user can ask for.
- h. 'Parking penalty'...  
This appears when the 'Finish time' explained in e. above is reached.

The instruction plate 2 Fig 1. is variable depending upon the country and laws of the land. Each country fits a plate with it's own rules and regulations. These may consist of parking times, charges and the permissible parking period.

The card slot 3 Fig 1. is designed to accept a parking card 7 Fig. 3 of similar dimensions to a credit card with a magnetic strip 8 Fig 3. The card is inserted in the direction of the arrow, 9 Fig 3. into the slot 3 with the magnetic strip 8 on the right hand side of the card, Fig. 6.

As the card 7 is inserted into the slot 3 the card 7 goes between two rollers, 11 Fig 4. and under a read/write unit 10 Fig 4. the card 7 pushes against a buffer 12 Fig 4 on a spring 13 Fig 4. The rollers 11 come together when the spring 13 is tightened to hold the card 7. When the card 7 is ejected the rollers 11 release the card 7 which is pushed out by the spring 13. The spring 13 only pushes the card 7 out it does not throw it out so that a third of the card 7 is visible.

The alpha numeric keyboard 4 Fig 1. This keyboard can be either a metallic push button one or similar. This keyboard 4 is used to key in the registration number, the parking time required and to alter this information if it is entered incorrectly. The 'end' key 14 Fig 5. is used to indicate that the information keyed in is correct. If it is incorrect the 'clear' key 15 Fig 5. is used to clear the information typed in so the user can start again.

The buttons on the keyboard 4 are split up into eight rows by five columns. The first two rows are the numerical buttons. The first row 1, 2, 3, 4, 5 and the second row 6, 7, 8, 9, 0. The next six rows are the alphabet buttons with the end 14 and clear 15 buttons. The third row has the buttons A, B, C, D, E. The fourth row F, G, H, I, J. The fifth row K, L, M, N, O. The sixth row P, Q, R, S, T. The seventh row U, V, W, X, Y, and the eighth row Z, Clear 15 and End 14. The clear 15 and end 14 buttons are twice the size of the digit buttons.

The ninth row is the stop button 16 Fig 5. This button is used to terminate all operations and result in the parking card being ejected without using any units and the registration number of the car and the serial number of the card 7 are cleared from the meter's memory.

The electric power is supplied to the meter from the control box 17 Fig 1. However, each meter has a rechargeable battery to be used in case of a power failure.

### HOW TO USE THE METER

#### The Parking Process

Fig 10a. shows a flow diagram of the parking process. When the motorist parks his vehicle he inserts the parking card into the slot 3 Fig 1. with the magnetic strip 8 on the right hand side of the card 7. The time available on the card 7 is displayed. The meter then displays a message on the display 1 line 3 Fig 2. requesting the car registration number to be keyed in. The motorist then keys in the registration number using the keyboard 4 Fig 1. This should not be too difficult and only takes a small amount of time. If the wrong number is keyed in then he presses the 'Clear' button 15 Fig 5. and re-starts. If the number is correct he presses the 'End' 14 Fig 5. button to store the registration number in the meter's memory 25.

The third display 1 line 3 Fig 2. then changes from 'time available' to ask for the 'parking time'. The motorist then uses the keyboard 4 to enter the required parking time in hours and minutes. He then presses the 'end' button 14 when he is satisfied.

If the number of units on the card 7 is insufficient the display 1 line 3 changes to 'insufficient units' and the card 7 is ejected. The display 1 then changes to 'insert new card' line 3. When the motorist inserts a new card 7 the previous units from the old card 7 are added to the units on the new card 7. This process continues until the accumulated time (in units) is more than or equal to the required parking time. If a new card 7 is not inserted within 20 seconds from displaying the message 'insert new card' the system will accept the time accumulated so far as the parking time.

If the units are sufficient then after the 'end' button 14 is pressed the 'finish time' is displayed on line 3 of the display 1 and remains until the finish time is reached after which the message 'parking penalty' will be displayed on line 3 Fig 2. (See M11 for details).

### THE DEPARTURE PROCESS

Fig 10 B shows a flow diagram of the departure process. When the motorist decides to leave the parking space he is expected to insert his card 7 to cancel the display 1 and credit the

card 7 with the units not yet used up if any. The time left (if any) is added to the time on the card 7. The display 1 line 3 Fig 2. then changes to show how much time is now available on the card 7 'time available'. The card 7 is then automatically ejected and the meter returns to a cleared mode ready to be used again.

If, however, the user leaves without inserting the card 7 to clear the system, once the parking time is exceeded by X min the system will clear itself automatically. X is taken as excess time which is determined by the meter operating authority.

### ISSUING PARKING TICKETS

The traffic wardens have access to the control box 17 Fig 9 which indicates which meter is in violation (if exceeding parking time). This helps them to avoid unnecessary walking. When they find a meter in violation and a car is still parked at that meter they will issue a parking ticket.

If the traffic warden comes across a meter with time on it but no car they can clear that meter by inserting a special master card. This will allow the meter to be used by other motorists. The loss of these units is then the fault of the motorist and he can not reclaim them.

### THE ENGINEERING LOGIC OF THE METER

When the card 7 is inserted, as shown in Fig 6. with the magnetic strip 8 on the right hand side, the magnetic strip 8 is read by the read/write unit 10 Fig 4 which is linked to the central processing unit (CPU) 18 Fig 7. via an interface 19 Fig 7. The number of units is stored into register A Fig 7. of the CPU 18. The card serial number is stored into registers D and E (see Fig 7.). Register A is compared to zero to determine if it is more than zero. If there are no units the card 7 is ejected with the message 'insert new card' appearing on line 3 of the display 1 Fig M1. If the number in register A is greater than zero then the parking procedure continues. The number of units is converted into hours and minutes using a 'read only' program stored in the meter's memory 25 Fig 7. which takes the tariff rate as a variable input (this rate can be modified by the authority operating the meters). The time in hours and minutes is displayed on line 3 of the display 1 as 'time available XXHr XXMin' (see Fig M2.). The whole process takes micro seconds so it seems that the reading is instantaneous. Fig I gives the flow diagram of reading and processing the number of units on the card 7 and the card serial number.



The motorist is then asked to key in the registration number of the car (see line 1, Fig M2). A flashing cursor comes up on line 1 as shown in fig M3. When the number is keyed in using the keyboard (No. 4. Fig 1.) it is converted into a hexadecimal number to represent it. When the 'end' key 14 on the keyboard 4 is pressed then the registration number is loaded into the memory registers H and L (Fig 7.) and compared with the five previously held registration numbers in memory 15. If it registers that the car was here previously then the card 7 is ejected and the 'no parking' display is shown as in Fig M5. and the meter then returns to waiting for a new input and the display returns to Fig M0. Fig II shows the processing of the registration number. If the registration number is accepted then the parking process will continue. Again this process takes micro seconds and therefore it seems to the motorist that it is instantaneous.

The parking time is then asked for 'parking time.....' as shown in Fig M6. The motorist is expected to key in the required parking time in terms of hours and minutes. This is loaded into register B via interface 23 Fig 7. (Fig III Shows This).

The contents of register B is compared with the max allowable parking time held in the meter's memory 25. If B is greater than the latter the message 'max parking time is Hr' is displayed (see Fig M7.) for 2 seconds. Then the parking time is asked for (as in Fig M6.) This process will continue until the user keys in a parking time less than or equal to the maximum permissible time.

Then register A is compared to B. If A is greater than B then the contents of B is subtracted from A and the new number is loaded into A. Then the new value in register A is written onto the card 7 as units using the read/write units 10 via interface 20. The card 7 is then ejected. The finish time is displayed as 'Finish time XX:XX' as shown in Fig M8. Fig III shows the logic for processing the parking time and the debiting of the units from the card. However, if A is smaller than B (i.e. there is not enough units) then the program displays 'insufficient units' (see Fig M9.) for 2 seconds ejects the current card 7 and displays 'insert new card' (see Fig M10). The units on the ejected card 7 are deleted from the card 7 and held in register A. When the new card 7 is inserted the serial number is loaded into registers D and E (Fig 7.) getting rid of the previous contents. The number of units on this card 7 are loaded into register C (Fig 7) then register A is added to C and the new figure is stored in A. If there is insufficient units this process continues until A is greater than or equal to B. However, if the user does not insert A new card 7 within 20 seconds and A is less than B then the system will display the 'finish time' using the available units in register A. Fig IV shows the logic of inserting new card in case of insufficient units on previous card.

When the motorist decides to leave he inserts the latest card 7 used into the slot of the meter. The card serial number is loaded into registers B and C (Fig 7.) If this is not the same then the card 7 is ejected as shown in Fig V. However, if the card serial number is accepted, then the difference between present time and finish time (if any) is converted into units and then loaded into register B. The number of units on the card 7 is loaded into register A and then added to register B and the new figure is loaded into register A. This new figure is displayed as 'time available' (see Fig M4.) before being written onto the card 7 by the read/write unit 10 via interface 20. The card 7 is then ejected. Fig VI shows this process.

All messages appearing on display 1 are via interface 22.  
 All commands from and to control box 17 are via interface 21.  
 All signals from the keyboard 4 are via interface 23.

### THE CONTROL BOX

The control box 17 Fig 9. consists of a suitable personal computer (P.C.) or similar. The control box monitors a number of meters which are linked to it with cables. We are only interested in the operations of the control box in relation to the meter as the contents of the box area standard feature. The control box can control meters in one road or a number of roads in the same vicinity. The control box will hold information about all cars parked. This information comprises car registration numbers, starting parking time, actual parked time and the number of violations in the area.

This information can be stored on a computer disc or any information retrieval system. This information can be used by statisticians to note areas of heavy or light use. The policeman use it to contact the owners of cars in an area where e.g. a theft has occurred, in case they may have witnessed something. The control box 17 can also be used to alter parking rules as well as tariff rates so there is no need to go around changing every meter if the rate changes. The control box 17 can set the time for all meters to display the present time.

The control box 17 will supply the power for each meter. The control box will check to make sure no one tries to park illegally. It has a battery which have enough charge to download existing data onto the retrieval system if a power failure occurs.

The control box 17 will have a screen for immediate data retrieval, a port for down loading information, a keypad for access, a printer to print out data on all meters and an alarm. Every time a violation occurs the control box 17 prints out a line of information consisting of the meter number, the car registration number, starting parking time and finishing

parking time. The traffic wardens will be able to use the printout to go straight to the meter, thus saving themselves the time in wandering up and down roads looking for violations. The control box 17 also sends a beep signal to a receiver carried by traffic wardens in the area to notify them that a violation occurred. The control box has an alarm that requires a password to be entered to allow access by authorised wardens. The retrieval ports are only accessible from within the box and also requires a password. So at any time someone can go around and retrieve all the information from only a small number of control boxes 17 instead of a large number of meters.

The control box 17 Fig 9. consists of a suitable personal computer or similar. The control box 17 monitors a number of meters in the same road or in a number of roads in the same vicinity. The meters are linked to it with cables. As far as the invention of the meter is concerned we are only interested in the interrelation between the control box 17 and the meters.

### CLAIMS

1. A parking meter capable of being operated by cards similar to phone cards and credit cards, consists of:

A body with a liquid crystal display (LCD), an instruction plate, a slot for receiving a parking card and an alphanumeric keyboard.

The said LCD comprises three lines of 26 digits each.

The said instruction plate exhibits the parking rules and regulations.

Said slot is capable of receiving a parking card with a magnetic strip pre-programmed with a unique serial number and a number of parking units. The said alphanumeric keyboard comprises 39 buttons, ten numeric buttons, 1,2,3,4,5,6,7,8,9, and 0, twenty six alphabet buttons from A to Z inclusive, a button for clearing the said display in case of typing errors, a button for accepting what was typed and a button for aborting the parking process if required.

2. A parking meter according to claim 1 has a read/write unit capable of reading the said card unique serial number and the number of units on said card as well as writing units back to the said card.

The said read/write unit is part of the hardware of a micro-processor which incorporates a program stored in the read only memory (ROM) of the said micro processor.

The said microprocessor has interfaces with the said keyboard, the said read/write unit and the said display.

3. A parking meter according to claim 1 and claim 2 is capable of operating either singularly or as a member of a group of meters monitored by a control box. The said control box consists of a suitable personal computer or similar.

4. A parking meter according to any preceding claims which can be monitored by said control box communicates with the said control box via interfaces connecting the computer inside the said control box to the said microprocessor.

5. A parking meter according to any preceding claim wherein the said ROM of the said microprocessor incorporates a program capable of carrying out the following:

- a. Running a timer displaying the present time at all times. In hours, minutes and seconds on the said display on the said meter.
- b. Reading the serial number and numbers of units from said card via the said read/write unit and storing them in memory. .
- c. Converts the number of units on said card using a predetermined programmable rate of exchange, into time available in terms of hours and minutes on the said display on the said meter.
- d. Stores in said memory and displays on said display the keyed in vehicle registration number and compares said registration number with previously stored registration numbers to check if said vehicle has returned before the minimum allowable return period. The said minimum allowable return period is a programmable variable.
- e. Requests the user to key in the required parking time. Compares said time with time available on said card as in (c) and the maximum allowable parking time. The said maximum allowable parking time is a programmable variable.
- f. If all conditions in e. are met, the said program deducts the said parking time from said time available on said card to determine new time available. Converts said new time available into units using the said rate of exchange in c. Records on said card, via said read/write unit, the said new time available in units and ejects said card. Displays finish time on the said display of said meter.
- g. If conditions in e. are not met:
  - i. If said required parking time is greater than said maximum allowable parking time, the said program displays on the said display of said meter 'Maximum parking time is \*\*Hr', where \*\* are the said programmable variable in e. The said program then returns to e.
  - ii. If said required parking time is greater than said time available on said card, the said program allows the user to insert new cards until the time available for parking is sufficient. The said program will then return to f.

6. A parking meter according to claim 5 wherein said program is also capable of allowing the user to reclaim unused parking time upon departure as follows:

- h. Reads via said read/write unit the inserted card serial number and number of units. Compares the said serial number with the previously stored serial number. Ejects said card if no match.
- i. If it matches, subtracts said present time from said finish time and converts the result into units using said exchange rate in c. if said present time is less than said finish time.
- j. The number of said units in i. are added to the number of said units on the said card in h., recorded on said card using read/write unit, displayed on said display on said meter in terms of hours and minutes then said card is ejected.

7. A parking meter according to claims 5 and 6 wherein said program is also capable of displaying the following messages on the said display of the said meter;

- k. Displays on line 1 on the said display:

KEY IN REGISTRATION NUMBER

Where  is the flashing curser.

- l. Displays on line 2 on the said display:

PRESENT TIME    \*\*:\*\* \*\*

Where first \*\* is hours, second \*\* is minutes and third \*\* is seconds.

- m. Displays on line 3 on the said display any of the following eight messages:

- (1) Insert new card
- (2) Time available    \*\*Hr    \*\*Min
- (3) No parking
- (4) Parking time            Hr            Min
- (5) Max parking time is \*\*Hr
- (6) Finish time    \*\*:\*\*
- (7) Insufficient units
- (8) Parking penalty

8. A parking meter according to claims 5,6 and 7 wherein said program is also capable of interfacing with the said control

box by conveying the said meter number, the said vehicle registration number, the said start time and the said finish time.

9. A parking meter according to claims 5,6,7 and 8 wherein said program is also capable of accepting data from said control box to set values for said programmable variables as defined in claims 5 and 6.

10. A parking meter according to any preceding claim capable of informing users on said display of said meter that a parking penalty has occurred.

11. A parking meter according to any preceding claim capable of accepting instruction from the user to abort the parking process at any time prior to commencing parking without loss of any units from the said card.

12. A parking meter according to any preceding claim capable of operating from a power supply or a rechargeable battery.

13. A parking meter substantially as hereinbefore described with reference to the accompanying drawing.